



Natural Resources Conservation Service
CONSERVATION PRACTICE STANDARD
MINE SHAFT AND ADIT CLOSING

CODE 457

(no)

DEFINITION

Closure of underground mine openings by filling, plugging, capping, and installing barriers, gates, or fencing.

PURPOSE

This practice is used to accomplish one or more of the following purposes:

- Reduce hazards to humans or animals
- Maintain or improve access and/or habitat for wildlife
- Protect cultural resources
- Reduce subsidence problems
- Reduce the emission of hazardous gases
- Reduce or prevent contamination of surface and ground water

CONDITIONS WHERE PRACTICE APPLIES

This practice applies to the investigation, design, and treatment of locations where shafts, subsidence pits, or adits of underground mines are open or where prior closures can be modified to accomplish one or more of the above purposes.

CRITERIA

General Criteria Applicable to All Purposes

Plan, design, and construct the mine closure to comply with all local, State, Federal, and Tribal laws and regulations.

Safety

Test all underground mines for hazardous gas prior to site investigation activities. If hazardous gas is present, a person with United States Mine Safety and Health Administration (MSHA) with certification for underground work must be onsite to monitor safety during the site investigation and practice installation.

All persons entering the mine must be accompanied by a MSHA certified individual.

Prior to construction, clearly identify and mark the collapse zone with fencing and warning notices. No person may enter this zone without wearing proper safety equipment.

Use bollards or bumper blocks or other devices to keep machinery and trucks from falling into shafts and subsidence pits. If possible, use equipment blades and buckets that are larger than the opening being filled.

If explosives or items that resemble explosives are found, do not handle them. Report the findings to the local MSHA office.

Bats and other wildlife

Incorporate fences, gates, or other closure techniques that maintain or enhance bat and other wildlife habitat where habitat exists. Write and implement an exclusion plan where bats or other wildlife inhabit the mine and wildlife friendly closures are not feasible.

Guidance for enclosures and gates for bat conservation purposes is found in “Bats and Mines” (Tuttle and Taylor, 1998).

Access

Use fences or gates where it is essential to occasionally enter or gain access to shafts or adits. For mines that are not permanently closed, provide security fence with conspicuously posted signs prohibiting entrance by unauthorized persons. Fences or gates must be made of steel, concrete, masonry, or “anti-intruder” chain link, or a combination of these materials.

Locate the fences or gates where subsidence or caving will not compromise integrity.

Discharge

If the discharge from the mine will be treated, use NRCS Conservation Practice Standard (CPS) Land Reclamation, Toxic Discharge Control (Code 455).

Monument

Mark the location of a completed shaft or adit closure with a brass cap in a concrete monument. On the brass cap, indicate whether the site is a shaft or adit, and identify NRCS as the contact for further information on each closure.

Additional Criteria for Designed Filling or Sealing

Remove all trash, debris, metal, timber, wire, and other materials that could hinder an effectively designed filling or sealing. Dispose of materials removed from the site by burning or burying at approved sites, or by transporting to approved landfills.

Grade the finished surface of the filled or plugged shaft or adit to provide free drainage away from the opening. Establish vegetation in accordance with NRCS CPS Critical Area Planting (Code 342). When necessary to provide surface protection where climatic conditions preclude the use of seed or sod, use the criteria in NRCS CPS Mulching (Code 484) to install inorganic cover material such as gravel.

Where needed, install a permanent drainage system using pipe or rock toes through the barrier. Use traps to prevent air or gas passage where necessary.

Protect stockpiled soil or rock materials from erosion until used.

Designed filling

Fill shafts or adits to 3 feet from the surface with a designed filter consisting of incombustible, nonacid-forming, free-draining materials or polyurethane foam.

Fill the remainder of the shaft or adit with earth materials including a minimum of 3 feet of clay compacted in 9-inch lifts or other impervious materials that would retard the passage of water or gas. Overfill shaft openings 10 percent of the depth of the shaft, or 3 feet, whichever is less, to allow for settlement.

Subsidence pits that are open, active, and/or passing a significant quantity of water require a designed filter of incombustible, nonacid-forming, free-draining material. Place sufficient soil covering to sustain planned vegetation.

Subsidence pits that are closed, inactive, and not passing a significant quantity of water require only backfilling with suitable soil material.

Overfill a sinkhole opening 10 percent of the fill depth, or 3 feet, whichever is less, to allow for settlement.

Sealing with plugs

Close a shaft with a plug only if another practical solution is not available. Plugs are used where the shaft must be closed at the ground surface but the shaft below the plug will remain open.

Construct the plug of reinforced concrete designed to support anticipated loads. Anchor the reinforced concrete on competent bedrock. Plugs may be designed to be watertight and gastight or to allow drainage and venting of gases.

Fill the shaft above the plug to 3 feet from the surface with a designed filter consisting of incombustible, nonacid-forming, free-draining materials or polyurethane foam.

Fill the remainder of the shaft with earth materials including a minimum of 3 feet of clay, compacted in 9-inch lifts, or other impervious materials that would retard the passage of water or gas. Overfill the shaft opening by 10 percent of the depth of the shaft above the plug to allow for settlement.

Sealing with caps and walls

Construct caps and walls of reinforced concrete or steel beams and grates or solid steel plates to completely close shaft or adit openings.

Design caps and walls with sufficient strength to support anticipated loads and securely anchor.

The cap, wall, fittings, access holes, and vent pipe must be reasonably vandal-proof. The surface of a cap over a shaft must be raised not less than 1 foot above the surrounding terrain to provide good visibility and positive drainage away from the cap installation.

Sealing with barriers

Construct barriers to restrict humans and animals from entering adits. Barriers may be used to prevent lateral spreading of backfill material and to support fill used to cover adit openings.

Construct barriers of stones, crushed rock, quarry-run rock, gravel, or similar nonacid-forming, free-draining materials.

The minimum filled length of the barrier must be three times the maximum adit height or width within the barrier section, whichever is greatest.

Concrete or masonry walls may be used to support the barrier. Barriers not supported by concrete or masonry walls must have 3 horizontal to 1 vertical or flatter slopes.

Cover barriers with soil materials to a minimum vertical thickness of 4 feet.

CONSIDERATIONS

Consider the effects on airflow and temperature of the mine caused by a closure. Small changes in environment can have significant negative or positive effects on suitability for bat use.

PLANS AND SPECIFICATIONS

Plans and specifications for closing shafts and adits will be in keeping with this standard and will describe the requirements for applying the practice to the specific site to achieve its intended purpose or purposes.

OPERATION AND MAINTENANCE

All components are to be maintained to accomplish their purpose.

Develop a site-specific operation and maintenance plan for closures.

REFERENCES

Tuttle, M.D. and D.A.R. Taylor. 1998. Bats and Mines. Bat Conservation International, Inc. Austin, TX.

USDA NRCS. 2017. National Engineering Handbook (Title 210), Part 633, Chapter 26, Gradation Design of Sand and Gravel Filters. Washington, D.C. <https://directives.sc.egov.usda.gov/>.

US Department of Labor, Mine Safety and Health Administration (MSHA), 2018, Title 30 CFR Chapter 1, Parts 1-199.